

JUNE 2011 MEETING

Wednesday, June 8, 2011 (1.5 PDH)

TECHNICAL PROGRAM

PRESENTATION (1.5 PDH)

Differentiation of Water Sources Using Analytical Water Chemistry Data

Speaker: John T Bryant, Ph.D., P.E., P.G. Bryant Consultants, Inc., Carrollton, TX, 75006, Tel. No. (972) 713-9109
John Thomas Bryant was born in Hobbs, New Mexico in February 1962. He attended Texas A&M University @ College Station, Texas from 1983 to 1991. He earned the following degrees from Texas A&M: Ph.D. in Civil Engineering, MS in Civil Engineering, MS in Geography, MS in Geology, and BS in Civil Engineering.

Dr. Bryant is a Committee Member of PTI (Post Tension Institute), ASCE (American Society of Civil Engineers) and TRB (Transportation Research Board). He has been awarded three U.S. Patents.

Dr. Bryant is a Licensed Professional Engineer in the States of Texas, New Mexico, Louisiana, North Carolina, Arizona and Colorado, Arkansas, Tennessee. He is also Licensed Professional Geologist in Texas, Tennessee and Mississippi.

In 1996, Dr. Bryant Established Bryant Consultants, Inc. (BCI) in Carrollton, Texas. He is currently the President of BCI. BCI provides a wide range of geotechnical engineering, earth science, and structural engineering services using state-of-the-art software, geophysical methods and in-house laboratory services.

PRESENTATION SUMMARY

To an audience of about 70 at the HESS Club, Dr. John Bryant gave a slide presentation titled "Differentiation of Water Sources Using Analytical Water Chemistry Data". Dr. Bryant has used chemistry in over a hundred forensic investigations that required the determination of the source of groundwater. He said knowing the source can be important since water can affect the performance of a foundation.



Dr. Bryant defined groundwater for this presentation as any subsurface water even though in the geologic world groundwater is defined as water below the water table. The topics covered by Dr. John Bryant included hydrologic cycle, general theories of flow and geochemistry, along with several case studies. He also gave the audience a handout of the presentation paper that he co-authored.

Dr. Bryant said knowing the source of water can help a foundation engineer design better performing foundations and to evaluate and/or design repairs for foundations with performance problems. Some possible reasons for the occurrence of abnormal groundwater around a foundation include poor surface drainage, sewer pipe leaks, subterranean geologic anomalies such as a filled-in gully or canal, a leaky outdoor spigot, and a cracked pool.

In his 5th slide, Dr. Bryant provided a decision tree called, "Water Source Differentiation Decision Tree", which he regularly referred during the presentation and which he uses in his analyses to determine the origin of the offending groundwater.

Some helpful points made by Dr. Bryant included:

- Using chemistry to help identify water source is generally not expensive and is underrated in current practice.

- As rainfall/snowmelt becomes groundwater, it is influenced by ionic species that dissolve into water, becoming "dissolved solids" to achieve chemical equilibrium.
- Major constituents (about 90%) of total dissolved solids (TDS) in groundwater include calcium, chlorides, magnesium, sodium, sulfates, and carbonic acid.
- The presence of a large number of TDS can imply that the groundwater is old rather than nearby surface induced.
- Natural soil contains fluoride as does some potable water systems, so it is important to scrutinize the levels of fluoride when present.
- Chlorine and Bromine, useful in determining if the source is due to a pool leak, will become undetectable after about 24 hours in the ground.
- When using chemistry, it is important to test the local potable water, pool water and other possible leak sources for comparison sakes.
- It is useful to install piezometers to retrieve groundwater at various penetrations.
- Testing the pH of the groundwater and comparing it with the pH of the local rainwater or the potable water can help indicate its source.

Dr. Bryant presented three case studies, beginning on [slide No. 28](#):

1. Determination of whether a pool leak caused the high moisture around the foundation.
2. Slope failure that caused the loss of the house.
3. Presence of abnormal water near surface around a foundation.

To download Dr. Bryant's presentation slides, [click here](#)

To download Dr. Bryant's source paper for his presentation, [click here](#)